slurry is applied. The following is from Section 7 of that document.

> In the present invention, on the other hand, the thermal expansion coefficient of the outer layer is increased by adding additional material to the outer periphery of the extruded honeycomb. This increase can be accomplished simply by applying additional material to the outer periphery of an already extruded honeycomb as illustrated in Fig. 1(b) copied below. Another way to achieve an increase is to grind off part of the outer region of an extruded honeycomb and then apply additional material to the remaining outer periphery as illustrated in Fig. 2(b) copied below.

FIG.1(b)

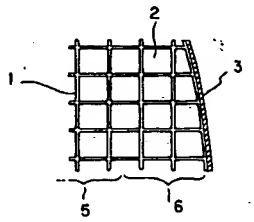
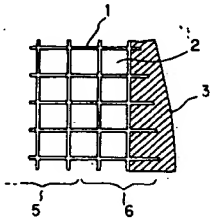



FIG.2(b)




> The first technique is described at page 12, line 16 to page 13, line 3, of the present specification; in that instance, the extruded thickness of the outer circumferential wall portion is 0.25 mm. The same raw material was then slurried and applied on the outer circumferential wall portion as shown in Figs. 1(a) and 1(b) to provide an outer wall thickness of about 1.25 mm. The data in Table 2 show the superior results obtained.

In addition to the technique discussed and quoted above, a second technique is described at page 19, line 1, to the end of page 20 of the specification. A grinder was used to grind down the outer diameter from 118 mm to 105 mm. The same raw material was then slurried and applied on the ground-down outer

circumferential wall portion (see Figs. 2(a) and 2(b)) to provide an outer diameter of 106 mm. The pertinent data appears in Table 4 and Table 5 reports the superior results obtained.

Figs. 1 and 2 are also described in Paragraphs [0016] to [0019] on pages 6-8 of the specification.

Addressing the Examiner's initial question of how the slurry "is applied," applicant submits with great respect that an artisan in the coating art knows how to apply a slurry. Paint, for example, is a slurry of pigment in a liquid suspending vehicle. Coating artisans know how to apply paint to a surface. Applicant's description that the slurry is applied is sufficient without more to appraise the coating artisan how to apply the slurry to the normally cylindrical honeycomb outer surface to make the coating.

According, review and withdrawal of this rejection are requested. If the Examiner, after considering the above explanation, maintains the rejection, she is asked to indicate on the record her concerns about applying a slurry.

2. The Office Action contains six rejections based on four references previously cited and applied. Applicant's arguments against these are presented in great detail in the Amendment Under 37 C.F.R. §1.116 filed March 3, 2003. In the latest

Office Action, the Examiner contends that with respect to Machida et al. '446 the characteristics of instant claim 1 would be expected to be the same absent any evidence to the contrary. The Examiner contends also that applicant has presented no evidence to prove that the TEC (thermal expansion coefficient) differential is different from what would be found in Kumazawa et al. EP '402, Machida et al. '446, and Kotani et al. '067. Applicant assumes that the Examiner has taken the same position with respect to Hamaguchi et al. '275.

A Declaration by Koichi Ikeshima is enclosed. That document provides experimental evidence demonstrating the difference (a patentable one) in the TEC differential between the products of the references and the presently claimed invention. Mr. Ikeshima describes the detailed comparison with Hamaguchi et al. '275 in Section 1 on pages 2 and 3 and with Machida et al. '446 in Section 2 on page 3. The comparative results of all four of the references are presented in Table 1 on page 5; those results are discussed below firstly regarding to the rejections involving Hamaguchi et al. '275 and Machida et al. '446.

3. Claims 1, 2, and 4 were rejected under 35 USC 102(b) as anticipated by Hamaguchi et al. '275. This rejection is traversed.

The present invention involves modifying a ceramic honeycomb so the thermal expansion of the honeycomb outer circumferential wall is greater than the thermal expansion coefficient of an inside partition wall portion. This structure causes stress to be applied to the inside partition wall portion from the outer circumferential wall portion as described in Paragraph [0025].

The advantage of the claimed structure also is described in Paragraph [0025]: the thermal shock resistance is increased, making it much harder to cause a thermal rupture of the honeycomb.

Hamaguchi et al. '275 teaches introduction of activated alumina inside the partition walls of a cordierite honeycomb structural body. These honeycomb bodies have smaller thermal shock resistance degradation by coating a high specific surface area-possessing material (i.e. the activated alumina) having a higher coefficient of thermal expansion than that of the cordierite carrier and a catalytic component of the carrier. See col. 3, lines 12-20. Hamaguchi et al. '275 provides no teaching or suggestion that the thermal expansion coefficient of the outer circumferential wall is to be greater than the thermal expansion coefficient of the inside partition wall portion.

In the Response to Argument portion of the Office Action, the Examiner contends on page 7 that "Applicant has not provided any evidence to prove the TEC differential is different from what is provided in the reference." (Original emphasis).

The Examiner's attention is directed to pages 2 and 3 of the enclosed Declaration describing how honeycombs were made by the method of Hamaguchi et al. '275 with excess slurry blown off in an air stream. See attached Exhibit A which illustrates the immersion and the air blowing off step. The TEC values appear in Table 1. The two sample values for the honeycomb are:

| | Positioned determined | |
|---|---|---|
| Honeycomb body | Outer | 0.46, 0.49 |
| | Intermediate | 0.48, 0.53 |
| | Central | 0.49, 0.55 |
| Catalyst | Outer | 1.07, 1.15 |
| | Intermediate | 1.13, 1.16 |
| | Central | 1.12, 1.14 |

As discussed by Declarant at the top of page 6 the thermal expansion coefficients of the products produced by Hamaguchi et al. showed in principle no practical difference among the

outer circumferential wall portion, the intermediate portion, and the central portion.

Mr. Ikeshima explains at the top of page 6 of the Declaration that the thermal expansion coefficients of the products produced by Hamaguchi et al. '275 showed in principle no practical difference among the outer circumferential wall portion, the intermediate portion, and the central portion.

As applicant has explained in previous replies, a uniform high TEC coating applied throughout the entire inside structure results in no differential between a higher TEC material on the outside and a lower TEC material on the inside as required by instant claim 1. Accordingly, there can be no proper teaching of the honeycomb structure of applicant's claims 1, 2 and 4. Review and withdrawal of this rejection is requested.

4. Claims 1, 2, and 6 were rejected under 35 USC 102(b) as anticipated by Machida et al. '446. This rejection is traversed.

Machida et al. '446 teaches eliminating the wasteful use of a catalyst by selectively sealing incomplete cells at an outermost peripheral portion of a honeycomb structural body with ceramic materials; see the Abstract.

Machida et al. '446 provides no teaching or suggestion that the thermal expansion coefficient of the outer

circumferential wall is to be greater than the coefficient of the inside partition wall portion. Machida et al. '446 merely teaches the partial coating of selective cells inside the outer circumferential wall. Thus, the invention disclosed in Machida et al. '446 is not relevant to the present invention because a required stress can not be applied to the inside partition walls with the partial coating of selective cells inside the outer circumferential wall.

The Examiner's attention is directed to page 3 of the enclosed Declaration where honeycombs made by the method of Machida et al. '446 are discussed. The TEC values appear in Table 1. The two sample values for the honeycomb are:

| | Positioned determined | TEC | |
|---|---|---|---|
| Honeycomb body | Outer | Portion A<br>0.50, 0.52 | Portion B<br>1.48, 1.52 |
| | Intermediate | 0.48, 0.51 | |
| | Central | 0.50, 0.55 | |
| Catalyst | Outer | Portion A<br>1.12, 1.13 | Portion B<br>1.84, 1.97 |
| | Intermediate | 1.13, 1.15 | |
| | Central | 1.12, 1.17 | |

Here Portion A is the complete cell that is not being sealed and Portion B is the incomplete cell that is being sealed with the ceramic material.

As discussed by Declarant (see the top of page 6), the thermal expansion coefficients of the products produced by Machida et al. '446 showed in principle no practical difference among the outer circumferential wall portion, the intermediate portion, and the central portion, except the B Portion. As to this exception, the Declarant states that no practical stress could be expected because the portions having higher thermal expansion coefficient in the outer circumferential wall portion were discontinued at the B portions, similar to a discontinued link. In this last sentence the word "not" should be deleted as is clear from the context; "not" was unnecessary because it was preceded by "no." In view of the failure of any practical stress to be exerted on the inner portion of the honeycomb, the Machida et al. '446 honeycomb does not meet the requirements of claim 1. Accordingly, review and withdrawal of this rejection is requested.

Claims 2 and 6 further define preferred features of the resulting ceramic honeycomb structure and are patentable for the same reasons that claim 1 is patentable.

5. Claim 1 was rejected under 35 USC 102(b) as anticipated by EP 0798 042 to Kumazawa et al or its U.S. equivalent U.S. 5,846,899. This rejection is traversed.

Applicant respectfully submits that all this reference teaches is merely immersion coating a normally-extruded honeycomb extruded body with a washcoat under two special conditions. First, the washcoat is γ-alumina with a thermal expansion coefficient larger than the thermal expansion coefficient of the honeycomb structural body. Second, a volume shrink is generated when a high temperature is provided after application of the washcoat. See page 4, lines 12-18 of the reference:

> In the present invention, in order to decrease a thermal expansion coefficient of the ceramic honeycomb catalyst comprising the ceramic honeycomb structural body and the carrier coated on a surface of the ceramic honeycomb structural body, two features of γ-alumina i.e. (1) thermal expansion coefficient being larger than that of the honeycomb structural body and (2) a volume shrink being generated on a high temperature are utilized.
>
> That is to say, if the carrier coated on the ceramic honeycomb structural body is subjected to a heat treatment at a high temperature, a volume shrinkage occurs, and the generated shrinkage functions as a compressive stress with respect to the ceramic honeycomb structural body.

There is no discussion in the reference of applying the special alumina material on only the outside of the honeycomb extruded body.

The Examiner's attention is directed to page 2 of the enclosed Declaration where Mr. Ikeshima describes honeycombs made by the method of Kumazawa et al. The TEC values are given in Table 1. The two sample values for the honeycomb are:

| | Positioned determined | |
|---|---|---|
| Honeycomb body | Outer | 0.49, 0.54 |
| | Intermediate | 0.50, 0.51 |
| | Central | 0.50, 0.53 |
| Catalyst | Outer | 1.09, 1.20 |
| | Intermediate | 1.11, 1.15 |
| | Central | 1.13, 1.13 |

As pointed out at the top of page 6 of the Declaration, the thermal expansion coefficients of the products produced by Kumazawa et al. showed in principle no practical difference among the outer circumferential wall portion, the intermediate portion, and the central portion.

In conclusion, Kumazawa et al. '899 (or its European counterpart) does not teach applying the wash coating material to the outside of the honeycomb body. Indeed, Kumazawa et al.

'899 is silent regarding the thermal expansion coefficient difference between the inside partition wall portion and the outer circumferential wall portion. The experimental data presented in the Declaration demonstrate that there is no significant TEC differential. Accordingly, Kumazawa et al. '899 provides no motivation to obtain nor suggestion of obtaining applicant's result where stress is applied to the inside partition wall portions from the outer circumferential wall portion.

6. Claims 1 and 2 were rejected under 35 USC 103(a) as unpatentable over Kotani et al. '067 in view of Kumazawa et al. '899. This rejection is traversed.

The Examiner is referred to Section 5 above where it is pointed out that the Declaration demonstrates that the Kumazawa et al. product is not a honeycomb having a TEC differential from the outside to the inside.

Kotani et al. '067 discloses a three step process to make a honeycomb as described in Example 1 in cols. 8-10. In a first step, a honeycomb is made within outer wall; see Figs. 1 and 2. The outer wall is ground away in a second step, and the absence of that wall can be seen in Fig. 3 copied below.

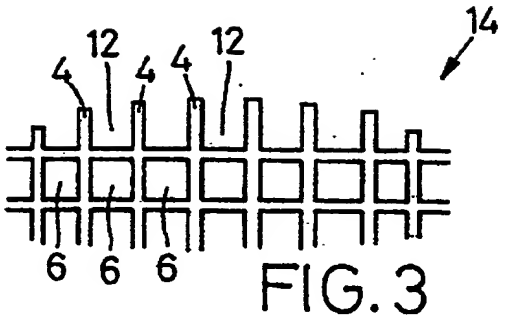



FIG.3

To permit grinding of the outer wall, the honeycomb first must have been fired to give to the partition walls 4 the structural rigidity needed to withstand the grinding process.

Finally, in a third step, additional cordierite material 16 is applied to make the thicker outer wall as seen in Fig. 4, copied below.

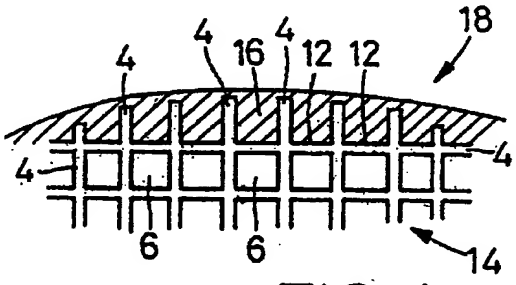



FIG.4

The deficiencies in combining these two references are discussed in Section 8 of the Amendment Under 37 C.F.R. §1.116 filed March 3, 2003.

The Examiner's attention is directed to page 2 of the Declaration for a discussion of the honeycombs made by the method of Kotani et al. '067. The TEC values appear in Table 1. The two sample values for the honeycomb are:

| | Positioned determined | TEC |
|---|---|---|
| Honeycomb body | Outer | 1.55, 1.63 |
| | Intermediate | 0.50, 0.52 |
| | Central | 0.49, 0.53 |
| Catalyst | Outer | 1.85, 1.93 |
| | Intermediate | 1.10, 1.15 |
| | Central | 1.14, 1.17 |

As discussed by Declarant (see the second and third paragraphs on page 6):

> In case of the present invention and Kotani, there was observed a big difference in the thermal expansion coefficient between the central portion and the circumferential wall portion.
>
> However, the declarant has realized that the stress can be given from the outer circumferential wall portion to the central portion only in the case that the shrinkage due to the temperature change of the product itself after firing occurs. Thus, in the case of the honeycomb structures obtained according to the method disclosed by Kotani, there is no room of giving substantial stress to the inner portion from the outer circumferential wall portion since the inner portion has been fired and become hard before the outer circumferential wall portion is coated after removing the distorted cells in the outer peripheral portions.

In other words, when the outer coating is applied in Kotani et al. '067 and fired, no additional stress will occur on the already fired inner portion of the honeycomb. Thus Kotani et al. '067 will not be applying stress to the inside partition wall portion from the outer wall portion as is required in the honeycomb structure in claim 1. Accordingly, review and withdrawal of this rejection are requested.

7. Claims 4 and 5 were rejected under 35 USC 103(a) as unpatentable over Machida et al. '446 in view of Kotani et al. '067. This rejection is traversed.

As discussed previously, Machida et al. '446 provides no teaching or suggestion that the thermal expansion coefficient, when measured in the diameter direction, of the outer circumferential wall is to be greater than the coefficient of the inside partition wall portion.

As discussed previously, Kotani et al. '067 fails also to teach or suggest applying stress to the inside partition wall portion from the outer wall portion as is required in the honeycomb structure in claim 1. Accordingly, there can be no proper combination of these two references to render obvious the subject matter of claims 4 and 5 which depend from claim 1. The Declaration establishes also why the claims are patentable

over these references. Review and reconsideration of this rejection are requested.

8. Claims 3-5 were rejected under 35 USC 103(a) as unpatentable over Machida et al. '446 in view of Kotani et al. '067 and further in view of Beauseigneur et al. '722. This rejection is traversed as well.

The deficiencies of Machida et al. '446 and Kotani et al. '067 in combination to suggest the claimed honeycomb structure are discussed above in Section 7.

Beauseigneur et al. '722 is cited for disclosing several examples of honeycomb structures having a range of the numbers of cells per unit area values and typical wall thickness requirements as recited in instant claims 3-5. However, because Beauseigneur et al. '722 provides no teaching or suggestion that the thermal expansion coefficient, when measured in the diameter direction, of the outer circumferential wall is to be greater than the coefficient of the inside partition wall portion, Beauseigneur et al. '722 cannot overcome the deficiencies of the two primary references. Accordingly, there can be no proper combination of these three references to deny patentability to claims 3-5.

It appears claim 7 is also rejected over these three references; see Section 14 [indicated as 4] of the Office

Action which follows the rejection of claims 3-5 in Section 13. However, because claim 7 depends from claim 1, claim 7 is also patentable because the three references fail to teach the basic honeycomb structure of claim 1. The rejection should be withdrawn.

Applicant respectfully submits that the application is now in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for all pending claims.

Should the Examiner deem that any further action by applicant would be desirable for placing this application in even better condition for issue, the Examiner is requested to telephone applicant's attorney at the number listed below.

Respectfully submitted,

PARKHURST & WENDEL, L.L.P.

July 18, 2003
Date

Charles A. Wendel
Registration No. 24,453

Enclosure: Declaration

CAW:EC/ame

Attorney Docket No.: WATK:210

PARKHURST & WENDEL, L.L.P.
1421 Prince Street, Suite 210
Alexandria, Virginia 22314-2805
Telephone: (703) 739-0220